Paper No. 49

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte DONALD T. J. HURLE, GORDON C. JOYCE,
and KATHRYN E. MC KELL

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Appeal No. 1997-0547
Application No. 08/020,443

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HEARD: September 14, 2000

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Before JOHN D. SMITH, PAK, and LIEBERMAN, Administrative Patent Judges.

JOHN D. SMITH, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal pursuant to 35 U.S.C. § 134 from the final rejection of claims 1 through 23.

Representative claim 1 is reproduced below:

1. A method of controlling the diameter of a growing crystal

including the steps of:

providing a melt of material in a crucible heated by a heater supplied by a power input;

bringing a seed crystal into contact with the melt;

providing a rate of relative rotation between the seed crystal and the melt; and

withdrawing the seed from said melt at a pull rate so that a crystal grows from the seed crystal, wherein during said withdrawing step there are included the additional steps of:

perturbing at least one of said power input to said heater, a rate of seed withdrawal, a rate of relative rotation between crucible and seed, and an applied magnetic field;

weighing one of the growing crystal and the melt to provide a weight signal indicative of the weight of the growing crystal; and

providing a feedback loop using signal processing of the weight signal to control said at least one of said power input, said pull rate, said rate of relative rotation and said magnetic field to control crystal diameter.

The references of record relied upon by the examiner are:

Cope 3,761,692 Sep. 25, 1973

Katsumata et al. (Katsumata) 2,140,704A Dec. 5, 1984

Hurle et al. (Hurle) "A Technique for Experimentally Determining The Transfer Function of a Czochralski Pulling Process," Journal of Crystal Growth, Vol. 74, 1986 pages 480-

490.

Appealed claims 1, 2, 5 through 14 and 16 through 23 stand rejected under 35 U.S.C. § 103 as unpatentable over Katsumata in view of Hurle.

Similarly, appealed claims 3, 4, and 15 stand rejected under 35 U.S.C. § 103 as unpatentable over Katsumata in view of Hurle further in view of Cope.

We do not sustain the stated rejections.

The subject matter on appeal is directed to a method of controlling the diameter of a growing crystal which is an improvement of prior art Czochralski crystal pulling processes of the type disclosed by the examiner's "primary reference" to Katsumata. Uniform crystal growth diameter has been achieved in such prior art processes by weighing the crystal with a load cell during growth. The load cell feeds a signal back to a computer for controlling parameters such as heat input and pull speed. The crystal weight or some function thereof is compared with an expected value and any error which is detected is used to correct the power input and/or pull speed.

In the first appeal of this subject matter (Appeal Number

92-1988 in Application 07/457,689 filed December 28, 1989), a previous merits panel of the Board determined that appellants' departure from the prior art systems and methods resides in the claimed step of "perturbing" at least one of the parameters of power input to the heater, the rate of seed withdrawal (i.e., pull speed), a rate of relative rotation between the crucible and the seed, and the parameter of an applied magnetic field. Appealed claim 1, now before us, essentially tracks appealed claim 1 in the prior appeal with the exception that appealed claim 1 now requires that the "perturbing" step occur during the "withdrawing" step wherein the seed is withdrawn from the melt at a pull rate so that the crystal grows from the seed crystal. Thus, as emphasized by appellants in their brief at page 4, the now claimed invention specifically requires that the perturbing, weighing and feed back steps occur during the withdrawing of the seed from the melt.

In finding the prior claims on appeal unpatentable under 35 U.S.C. § 103 in view of the combined disclosures of Katsumata and Hurle, the prior Board panel determined that Hurle's Figure 3 embodiment and the text of Hurle at pages 482

and 483 "constitute a clear teaching of the called for on-line process." See the prior Board decision at page 4. However, the prior Board panel indicated that "Hurle and Joyce who are co-authors of the applied Hurle prior art reference, are also co-inventors of the present subject matter." Accordingly, the prior Board panel indicated that in such a situation there ought to be some "critical review by Hurle and/or Joyce of what the teachings of this reference would have suggested to one skilled in the art." See footnote 1 at page 4 of that decision. The present appeal involves not only amended claims which are more limited than the claims presented in the prior appeal but also such a critical review by Hurle as to what the applied Hurle prior art reference actually would have suggested to one skilled in the art. In view of the new evidence of record, i.e., the declaration by Hurle executed March 11, 1993, and the arguments based on this evidence, it is our view that the prior interpretation of the prior art publication to Hurle by the previous Board panel is no longer applicable.

Respecting the disclosures of the prior art publication to Hurle, appellants correctly point out in their brief at

page 7, that Hurle is concerned only with the measurement of the "transfer function" for a conventional Czochralski process, and the Hurle method utilizes perturbations and a study of the results of those perturbations to determine the transfer function. As appellants point out in their brief at page 7,

> "the fact is that the Hurle reference is not concerned with any automatic control loop and instead is solely concerned with the determination of the transfer function of the process which would later be incorporated into an automatic control system, although the manner and how the transfer function is incorporated into this control system is not specified" (emphasis added).

The arguments made by appellants in their brief are buttressed by the statements made in the Hurle declaration. Thus, at paragraph 15.2 of the Hurle declaration, Hurle indicates that a person of ordinary skill in this art "would perceive that the techniques in the paper should not be used to grow crystals but only to determine the transfer function. At paragraph 15.4, Hurle further indicates in his declaration that a person of ordinary skill in the art would understand the perturbations applied by the Hurle publication "were for measuring how the system responded to such perturbation so

that the transfer function could be determined." Hurle further indicates that "such a person would understand that in any system for growing crystals deliberate perturbations should be avoided since they would be expected to introduce defects in the growing crystal." Evidence supporting Hurle's opinion is found in the Hurle publication at page 487 which indicates that the "usual high standard of overall crystal shape" could not be maintained during the prior art Hurle experimentation. Further, at paragraph 15.5 of the Hurle declaration, Hurle indicates that a person of ordinary skill in the art would find no teaching, suggestion, or inference in the Hurle paper that perturbations could be combined with automatic diameter control in order to achieve improved control of diameter. At paragraph 15.6, Hurle further indicates that a person of ordinary skill in the art would understand that such perturbations referred to in the Hurle prior art publication were to be avoided since they would prevent the correct shape of crystal being grown. At paragraph 15.7, Hurle indicates that a person of ordinary skill in the art would find no teaching in the Hurle prior art publication on how perturbations could be related to crystal

diameter measurement.

In his answer at pages 6 and 7, the examiner essentially takes the position that the Hurle declaration is "merely opinionary and does not give supported factual evidence." The examiner further indicates that there is no factual basis to support Hurle's definition of a person of ordinary skill in the art as defined at paragraph 15 of the declaration as one having at least 3 years of engineering college formal academic training, 7 years experience of growing crystals, with a knowledge of the difference between methods of and equipment for determining a transfer function and for crystal pulling. Thus, the examiner discounts the opinions set forth in the Hurle declaration on the grounds that Hurle "merely opined the level of skill."

While expert opinions expressed without disclosing the underlying facts or data upon which the opinion is based may be given little or no weight, Rohm & Haas Co. v. Brotech Corp., 127 F.3d 1089, 1092, 44 USPQ2d 1459, 1462 (Fed. Cir. 1997), Hurle's definition of a person of ordinary skill in the art of crystal growing is factually based on Hurle's over 30 years of "pioneering and unbroken research in the field of

crystal growth." See paragraph 7 of the Hurle declaration. Moreover, while generally no weight is given to expert testimony on the ultimate issue of obviousness, the level of skill in the art is a factual matter and is properly the subject matter of expert testimony. GN v. SW, 57 USPQ2d 1073, 1077 (Bd. Pat. App. & Int. 2000). Because the examiner erroneously disagreed with Hurle's definition of a person of ordinary skill in the art of crystal growing, the examiner necessarily erred in discounting Hurle's interpretation of the relevant disclosures in the relied upon Hurle prior art reference. In so doing, the examiner committed reversible error in refusing to allow the now appealed claims for obviousness.

In light of the above, it is apparent that we cannot sustain the stated rejections of the appealed claims under 35 U.S.C. § 103. Accordingly, the decision of the examiner is reversed.

REVERSED

JOHN D. SMITH Administrative Patent Judge	)	
CHUNG K. PAK Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
PAUL LIEBERMAN Administrative Patent Judge	)	

JDS:lmb

NIXON & VANDERHYE
1100 NORTH GLEBE ROAD
8TH FLOOR
ARLINGTON, VA 22201-4714